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1965

Contents

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University of Western Australia

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non loqui

U.E.C. COMMITTEE, 1964

Standing (Left to Right): D. F. Feldman, D. R. Harvey, E. D. Lazarus, J. R. Coxon.
Sitting (Left to Right): M. J. Paul (Treasurer), S. N. Langford (President), G. H. Whitehead (Vice-President), F. S. Pitman (Secretary). Absent: P. T. Coronel.

Editorial

The University Engineers' Club has a tradition that is almost unique in the University. For years Engineering was all powerful in sporting and social affairs and in campus activities generally, but we have lost this supremacy with the tremendous growth of other faculties and we are in danger of jeopardising our heritage due to inactivity and lack of enthusiasm. That we can never expect better than a sixty per cent response to U.E.C. functions (usually much less) or sufficient spectators to raise an encouraging cheer at Goyder Cup sports is a poor reflection on "the silent men who do things". And whether for better or for worse, this will go down as the year that the Exhibition was cancelled.

Far too few realise the benefits of belonging to a fraternity such as a vigorous student group. The U.E.C. is not run for the purpose of subsidising a few wild shows and the odd keg here and there. Its purpose is to unite and represent its members and to confer a "professional" status at undergraduate level. It provides the facilities, the opportunities and the incentives to broaden our horizons and establish ourselves as active members of a community, not mere problem solvers. Those who fail to take advantage of what the U.E.C. can offer are doing themselves, as well as the club, a disservice. All that is needed is regular support of the club's functions and a willingness to contribute assistance if required. Almost invariably it seems, the bulk of the work is done by an odd one or two, simply because no one else can be bothered.

President's Report

Dear Members,

In retrospect I look back on 1964 and see that the Club experienced another excellent year. However, when looking into the past it is always easy for one to recall good points while those bad ones are normally pushed into obscurity. In these few words I intend to mention both sides as this is the only way to be properly critical.

It was soon obvious as 1964 began rolling by that a glaring weak point existed within the Club. This, namely was the lack of participation in Club activities by the majority of final year students except perhaps where it expressly suited them to do so. It is through the avenue of greater final year student participation that I know the Club will prosper because it is to this group that the lower years will naturally look for leadership and spirit.

On the other side of the ledger far more must be said. Socially the year went well with both the Ball and Dinner being well supported and maintaining their high standard with no equal on the campus. The Bucks' dinner once again proved successful allowing many a member to express his normally hidden emotions.

On the sporting fields the Club came in as runner-up to the Scientists for the Goyder Cup. However, the gap to be covered, so as to turn the tables with Science, is large but well within reach if all Engineers apply themselves. The show of club spirit and support in the bath tubs where Engineers swept all before them for another year was certainly an ideal example as a goal at which to aim.

In another sphere the Club improved with better facilities in the Common Room and in particular by the acquisition of a better piano. By the end of the year plans were well ahead for a new Club tie of the same design but better cloth. Previously regarded as one of the best University Club ties in Australia this move can only improve its standing.

Finally, as a suggestion on my part for the Club to maintain and improve its standard, I exhort all its members to enthusiastically strive together towards a common goal within the Club and I wish all members who do so their due successes.

Yours faithfully,

S. N. LANGFORD,

President, 1964.


MELBOURNE

PULSE WIDTH MODULATED TRANSISTOR AUDIO AMPLIFIERS

M. Townshend, Fifth Year Electrical

The usual approach to the design of linear transistor amplifiers is to adapt the conventional configurations developed for thermionic valves to transistors. When transistors are used as power amplifiers in class A, AB or B modes, certain difficulties are encountered.

The first and most important is that of heat dissipation, maximum efficiency being only about 70% in Class B; also in portable equipment, high efficiency output stages are desirable to reduce drain on the batteries. With Class B operation, matched output transistors are usually required, and the problem of cross over distortion and thermal runaway make designs difficult and cumbersome.

In Class A, AB or B operation the capabilities of the transistor are not used to the best advantage. The transistor functions well as a switch as its forward resistance is very low when fully conducting, and very high when turned off.

By the use of well-known pulse techniques, a pulse waveform at ultrasonic frequency can be obtained upon which audio frequency information can be impressed as pulse duration modulation. The pulse waveform can be readily amplified by semiconductor devices operating as switches. Finally, the audio information can be recovered by means of a low pass filter.

To consider the actual operation of such an amplifier, it is best to look at the loud speaker (which can be considered a "low" pass filter), and then proceed backwards through the amplifier.

With no audio signal present, the voltage waveform on the loudspeaker is a square wave with a fundamental frequency of approximately 50 KC/S with unity mark: space ratio i.e. $t_1 = t_2$ (Fig. 1). At this frequency the current flowing is small due to the relatively high impedance of the loudspeaker at 50 KC/S.

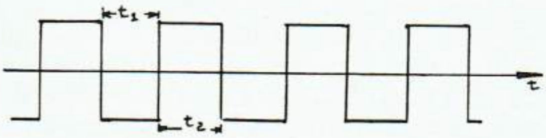
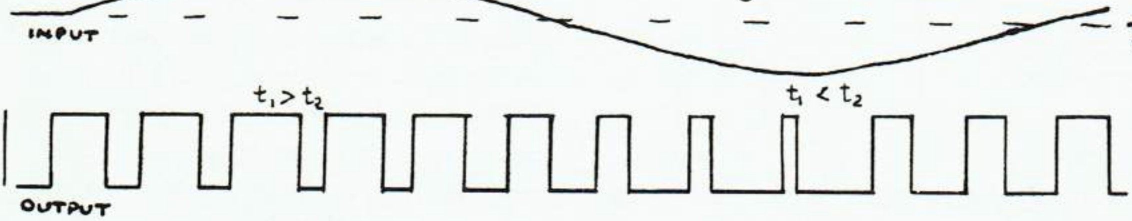


Fig 1

If an audio signal is now applied to the input of the amplifier, the mark-space ratio of the square wave on the loudspeaker is varied, accordingly, i.e. a "positive" cycle of input signal increases t_1 and decreases t_2, and vice versa a "negative" cycle of input decreases t_1 and increases t_2 (Fig. 2).

At audio frequencies, the impedance of the loudspeaker is much lower than at 50 KC/S, resulting in current flowing in the speaker. The

Fig 2



extent of cone movement depends on the ratio of the times t_1 and t_2, i.e. upon the percentage deviation of the mark : space ratio from unity. The relationship between cone movement and mark : space ratio is entirely linear, so that the square wave mark : space ratio is varied linearly with respect to the applied audio signal, this being the basis of a linear amplifier.

Several interesting points arise from this system.

1. Provided the square wave is "accurately square", and switching is done from zero to full rail voltage, no power is dissipated in the active devices doing the switching.

2. If the output stage consists of two transistors being alternatively switched hard "on" and "off", the output source resistance is substantially zero.

3. No harmonic distortion is introduced.

The efficiency of such an amplifier can be made to approach 100% by the insertion of a very low loss, low pass filter in series with the loud speaker to prevent alternating voltages at 50 KC/S and harmonics associated with the step function from appearing at the voice coil of the loud speaker (which has finite resistance).

The cut-off frequency of all the switching transistors in the circuit must be of the order of 20-30 mc/s to handle the higher harmonics present in the square wave (See Fig. 1 above).

Transistors can readily be used as switches, so also can silicon controlled rectifiers, provided their turn-on and turn-off times are sufficiently short.

With these latter devices, power outputs of several hundred watts can be envisaged.

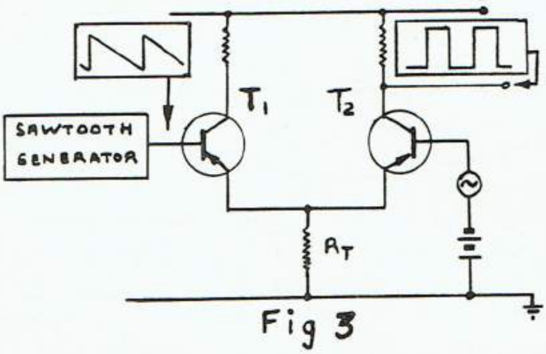


Fig 3

Pulse Modulators

The modulator is required to convert amplitude differences to time differences. The primary waveform is therefore one which has a linear amplitude to time relationship, i.e. a saw tooth. By feeding an ultrasonic saw tooth waveform, plus an audio signal into a "slicer", or voltage coincidence detector, the required wave form may be produced (Fig. 3). In this case a long-tailed pair coincidence detector is shown by way of example. The operation of the circuit is as follows: At the start of the saw tooth run-down, the base of T_1 is negative, so that T_1 conducts heavily. T_1 emitter current flows in the "tail" resistance R_T and develops a negative voltage on the emitter of T_2, which is by choice more negative than the base of T_2. T_2 is thus cut off and its collector voltage is therefore equal to the supply voltage. The circuit remains in this condition whilst the saw tooth run-down continues, until the point is reached where the base voltages of the two transistors are substantially equal. At this time T_2 commences to conduct, and its collector potential falls.

For a short time both transistors conduct, but continuation of the saw tooth run-down causes T_1 to cut off whence T_2 conducts heavily. The circuit remains in this condition until the end of the run-down when, with the fly back of the saw tooth generator, the cycle recommences. The timing of the voltage transition of the output waveform depends on the instantaneous value of the voltage at the base of T_2, that is on the audio input signal. The battery shown in Fig. 3 provides bias equal to the mean value of the saw tooth, so that in the absence of audio modulation the mark space ratio of the output square wave is unity.

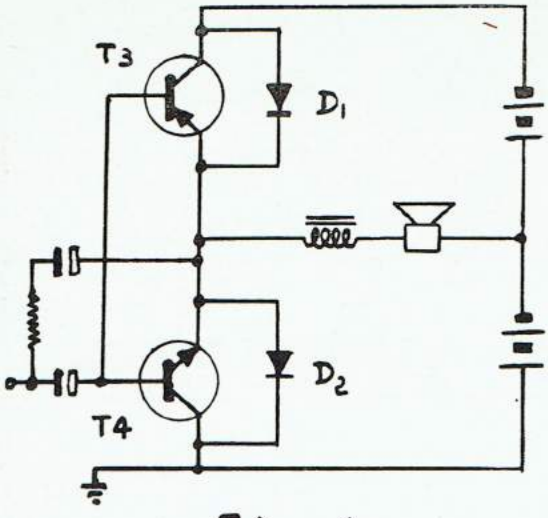


Fig 4

The next step in the amplifier is the driver stage. A matched pair of p-n-p/n-p-n transistors T_3 and T_4 (Fig. 4), operate with one cut off and the other driven into saturation alternately by the 50 KC/S square wave. The diodes D_1 and D_2 are necessary to prevent difficulty when their respective transistors are required to carry large reverse currents during the peaks of loud low notes, since the reverse current-gains are normally insufficient to ensure saturation under such conditions. The emitters as well as the bases of these transistors are directly cross connected, ensuring that both transistors do not conduct at once. Both collectors go to the negative and positive terminals of the battery respectively and the return current from the speaker goes to the centre tap of the battery.

The maximum power that can be realized from such a stage is limited by the maximum current that can be passed by the transistors T_3 and T_4 when fully conducting, not by their maximum power handling capacity.

From this short discussion it can be seen that pulse techniques offer an attractive alternative method of audio amplification to the established method. Both short term and long term performance is always good, as the overall characteristic of the amplifier does not depend upon the state of the transistors, power consumption is small, and the quality of reproduction is high.

The disadvantages of this system are the added complexity of design and the requisite high frequency performance of the transistors as well as the possibility of high frequency radiation and low pass filter design difficulties. These disadvantages, however, should not be a problem in the future when simplified designs (e.g. microcircuitry) and clever commercial dodges and compromises are evolved to make pulse width modulated amplifiers strong competitors against conventional systems in the field of high quality audio amplification.

A certain Scottish lecturer (mechanical) who shall remain unnamed has set a new standard in report making. We earnestly hope that this trend will continue and perhaps spread to the technical literature, thus stifling once and for all any suggestion that engineers collectively are "Intellectual Yahoos". We quote:

Report: ". . . . . this total conservation is the strength of the integration and combined with a high degree of mechanisation has built up a competitive industry with a specialised and assured market."

Lecturer: "How about:
'This total conservation
Is the strength of the integration,
And combined with a measure of mechanisation
Has built up a specialised marketisation'.
Thanks for the poetic inspiration
Your work has gained my admiration."

Report: ". . . . sawdust, furnace gas, uncondensed retort gas, supplemented with some furnace oil. Cheap power is the obvious result. The power house is almost completely automated."

Lecturer:
"May I once again disclose
The natural rhythms of your prose?
Saw dust, furnace gas, uncondensed retort gas
Supplement with furnace oil
Bring the whole lot to the boil
With your power house automated
Other systems are outdated
Then your lecture notes consult
Cheap power's the obvious result."

Should a University Engineering Course be shaped to suit the Local Scene?

J. R. Blair

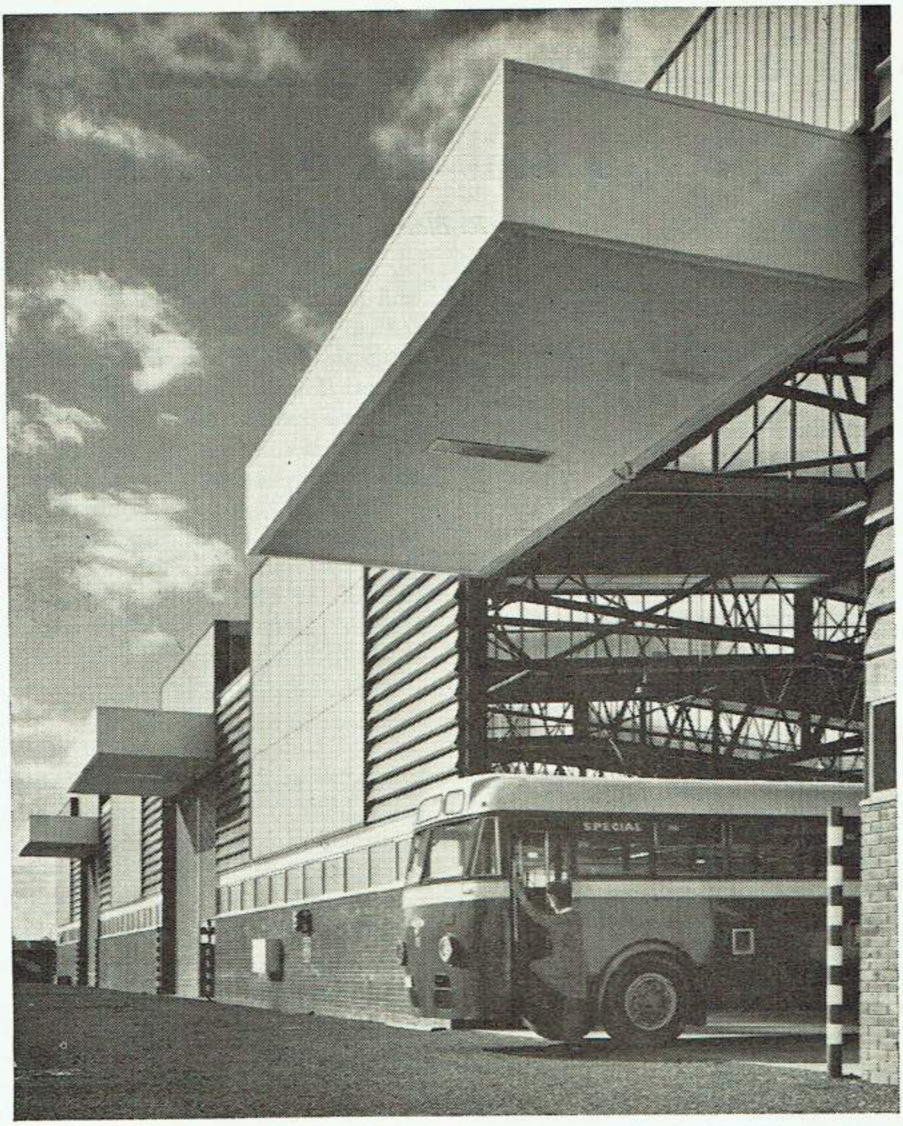
One of the most interesting subjects under discussion in the Faculty at the moment is the relationship between the university engineering course and the local industrial scene. As a recent arrival in Western Australia from a different academic climate, I have been intrigued by the attitudes I have observed here.

Before entering into a discussion on this subject, it might be profitable to examine the words "University" and "Engineering". What do they mean? The classical definition of a University is "a place of learning and education". It is much more difficult to find a satisfactory definition of an Engineer. Various dictionaries give a number of meanings ranging from "one who contrives, designs or invents" to "one who manages an engine".

Perhaps the reason for the confusion is the diverse field covered by the blanket term "engineer", and added to this is the ever-changing nature of the subject. The classical type of engineer was a person who started life as a craftsman and, because of his ability and interest in furthering his craft or trade, he was promoted to the professional engineering status. His outlook was an essentially practical one. It is into this category that the fathers of British engineering fall—people like William Telford, who served his apprenticeship as a stonemason before becoming a designer of buildings and canals, and who eventually designed and built the suspension bridge over the Menai Straits in North Wales; or James Watt, who rose from being an apprenticed instrument maker to study and vastly improve the art of converting steam power into mechanical power. Both of these men belong to a category which could be called Practical Engineering.

During the last fifty years the development of another philosophy, which could be termed Analytical Engineering, has been brought about by the unprecedented advance of technological and scientific knowledge. Ignorance of mathematical and scientific principles imposed severe restrictions on the progress of the Practical Engineer. The Analytical Engineer, however, is well equipped in these fields. His formal training includes a firm grounding in mathematics and the physical sciences, and he is encouraged to use these tools in his understanding of his subject. This approach, although it has only been developed recently, is by no means new. One of the greatest examples of the analytical engineer, Leonardo da Vinci, used this method in the fifteenth century.

The responsibility of producing the Analytical Engineer has fallen mainly on the universities and has been shared only in very recent years by Colleges of Advanced Technology or their equivalents. The university student has the opportunity of studying mathematics and science in an academic atmosphere. He is also encouraged to mix with students of the liberal arts, with the result that the product of the University Engineering Faculy must inevitably have a different outlook from that of the Practical Engineer. In a way, the university graduate in engineering probably has more in common with a scientist than he has with his brother, the Practical Engineer. Because of the scope and diversity of his formal training, his mind tends to be more flexible and less trammelled with small details. His contact in university with students of economics, psychology and other arts subjects, although very brief, prepares him for the wider fields of administration and management. He is obviously less competent than the practical engineer when he is faced with a problem requiring practical knowledge. He is aware of the general principles of the milling process, for example, and may even be able to analyse the mechanics of the cutting action but, because of his lack of detailed knowledge, he would have great difficulty in supervising the choice of the



correct tools to perform the operation, whereas this would be second nature to the practical engineer. If he were required to do so, however, the analytical engineer could investigate very thoroughly every stage of the milling operation, steps such as selecting the correct face angles of the cutter or preparing the critical path for the material, and with the aid of his mathematical tools (or a mathematical model simulated by a computer) he would be in a position to advise the practical engineer on the correct procedure for using the machine. In other words the analytical engineer is in a paradoxical situation in that he has a broader outlook than the practical engineer (because of his more general training), and is at the same time more capable of tackling a specialised job.

To return to the original question of the relationship between a university engineering course and the local industrial scene, it would appear that the answer must lie in the attitude of the university or department in question. If the aim of the department is to train practical engineers, then it would be very useful to adapt the course to suit the local problems; but if it seeks to produce an analytical engineering graduate, and by definition it is almost bound to, the local scene will have little influence in determining the course which will be general in nature. However, the converse of this argument is not true. In areas of the United States, such as Boston or Stanford, the leadership and pioneering spirit shown by the universities have attracted industrial growth.

Seen in this light it might appear that the university is training people who will become leaders in the industrial world; but this is only true in certain circumstances, and even then the graduate is only one link in a long chain. His broader training is suited to managerial or administrative work, where he is in a position to bridge the gap between the theories of the economist and the reality of the production shop. In research, the trained analytical engineer's background of mathematics and physical sciences allows him to appreciate the work of specialists in those fields. Here again the analytical engineer bridges the gap between pure science or mathematics and the useful end product.

It is in the field of production processes that

the practical engineer plays his part, which is just as important as that of the analytical engineer but of a very different nature. His contribution lies in his ability to manage everyday affairs and perform routine work. His intimate knowledge of the processes of production and maintenance is essential to the life of any engineering establishment.

Because of the demands made of the university graduate in engineering, he requires a very special course. Not only must it contain the basic mathematical, physical science and engineering requirements, but it must also stimulate the student's interest in other fields. His horizons must extend beyond those of engineering and he must be sensitive to his position in the community. To this end he should be acquainted with the works of the liberal arts if not conversant with them. In America, the engineering student has units in the liberal arts included in his course, and in Britain the student entering university is older and has had a more thorough introduction with the result that he is more mature in his approach to the arts at universiy. Australian universities seem to have been negligent in meeting this requirement. The concept of the analytical engineer would not appear to have been completely accepted although here, to a greater extent than anywhere else in the world, the engineer is called upon to tackle situations which are far beyond the bounds of practical engineering.

If our graduates are to meet the demands made of them in the future, it is the university's main task to look beyond immediate problems and try to cultivate the breadth of vision required to face the challenges of a developing country.

A History of Brewing

W. A. Southwood

There is some dispute as to whether the Egyptians or the Chinese were the first to brew beer. Certainly a drink made from malt existed in Sumeria around 4000 B.C. Some historians, however, maintain that the Chinese were brewing a drink from maize ten thousand years ago. Unfortunately very little evidence is available on Chinese brewing practices.

Over thousands of years, man changed from a hunter of animals to a farmer. Around 4000 B.C. we find signs of houses, not temporary dwellings of a nomadic hunter but places of permanent residence. Man settled on the fertile banks of the Nile and on any land which would grow crops. The domestic duties such as cooking, grinding wheat and corn for flour and even sowing and harvesting crops were carried out by women while men hunted wild animals.

The first beer was probably produced by accident. The basic ingredient of beer is malt: grain which has germinated. Malting was common practice long before beer was thought of. Bread was often made using malted wheat or barley and a batch of dough may have been left too long before cooking and fermented through the action of wild yeast. Whatever its origin, a drink evolved whose basic ingredient was malted barley. This crudely produced drink would have been very acidic and probably barely drinkable.

Over hundreds of years man became more settled and his technique of brewing more refined. By about 2000 B.C. people had formed small cities and in Egypt beer shops were an established part of the scene. These beer shops were usually run by women who brewed their own beer and it would appear that many undesirables were attracted to them. Records on papyri shows laws forbidding disorderly conduct and political discussions in beer shops.

From the crude early Egyptian technique evolved the basic "home brewing" method still used in some parts of the world today. Grain—wheat or barley—was pounded, often by hand, and freed from the husk. To this was added malted barley and aromatic substances. This dough was baked lightly to produce "beer bread". In this state it could be stored for some

time. This process is analogous to the malting in a modern brewery. When the brewer was ready to brew he (or more often she) would crumble the cake into a large vessel. The cake was then mashed by workmen treading the bread in water. Salt was added and fermentation began. The importance of yeast was not realised until around 1500 B.C. and fermentation was started by wild yeast from the air.

Beer produced by this method contained about six to eight per cent alcohol. Since the yeast was a "wild" as distinct from a "cultured" variety it could stand temperatures of up to 50 degrees centigrade. Such yeasts will reproduce in a high concentration of alcohol and strengths of up to twelve per cent could be obtained. The beer was drunk from large vessels through a straw because of the barley husks in the brew. Beer is still produced in this manner today.

Beer was an important part of the everyday life of the Egyptians in the first and second millennia B.C. It also had a marked effect on the economy. In Mesopotamia forty per cent of the total cereal crop was used in brewing. Workers in Sumeria wheer the economy was controlled from the temple, were paid one litre of beer per day to supplement their wages; the "white collar workers" and ladies of the court received two litres per day, while important officials could command an income of up to five litres per day. Beer was used in religious rites and every sacrifice was accompanied by a gift of beer for thirsty gods. It is estimated that during his reign, Pharaoh Rameses the Second supplied the gods with half a million gallons of beer.

The Sumerians and Assyrians improved on the Egyptians' brewing technique. The Sumerians in particular, used a wide variety of flavouring ingredients including hops, but hopped beer did not become popular until the eighth century A.D.

The Greeks and Romans added little to the existing knowledge of brewing. To the Greeks beer was a barbarians' drink and the Romans were openly scornful of it. This attitude has persisted among the southern European races until the present day. The abundance of grapes in these regions made wine the universal drink and winemaking developed as an art in much the same way as brewing had done in Egypt.

If beer was not popular with the Romans it nevertheless was adopted enthusiastically by the northern and western European races, and it was in this region that the greatest advances in brewing were made. By the first century A.D. these peoples had developed a number of varieties of beer.

It is now necessardy to define three terms: beer, mead and ale. Beer is the general term for all types of fermented malt beverages. Mead was a strong drink containing up to eight per cent alcohol; it was drunk by the northern Europeans and would have been similar to the Egyption beer. Ale was lighter than mead and was originally made from honey. The transition to barley occurred during the first century A.D. It is fairly certain that mead was the drink of the ancient Britons and that it was both potent and abundant. Gradually however, it was watered down to a much weaker drink. Whether this was due to a change of palate or to economic considerations is open to speculation.

In Europe during the first millenium A.D. brewing was almost entirely a domestic affair. Every farm would have its brewing cellar and later on the monasteries incorporated quite large breweries. It was in these monasteries that most of the advances and refinements of the brewing technique were evolved. They produced the best beer of that time and were generous and hospitable to visitors. Often the village baker brewed beer as a sideline and in many towns a brewery was situated next to the bakery. The beer was flavoured with a wide variety of herbs and other aromatic plants. Hops were not used widely in beer until about 820 A.D. From then onwards hops took over from all other herbs to become the main flavouring agent in beer.

From the writings of the Danes and Anglo-Saxons it is evident that ale played a great part in the life of the ordinary man. It seems that mead was also popular for in the poem "Beo-

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The young fellow who got up one morning and decided it looked so nice out that he would leave it out?

The newly weds who sneaked out of the wedding reception early to go up and get their things together?

An Open Letter to the Undergraduates of the University of W.A.

81 St. George's Terrace,
Perth, W.A.

Dear Undergraduate,

You are embarking on a career—a professional career.

When qualified and established, your ability and knowledge will be available to the public in one form or another. The best will be expected of you.

Similarly throughout your life, you will require the services of others in the community—Bankers, Plumbers, Mechanics or fellow Professionals. You will expect the best from each of them in turn.

You will use Life Assurance in one form or another. As a service, it does at its best demand a specialized knowledge and a continuity of confidential personal attention.

In this respect I wish to place myself at your disposal.

Yours faithfully,

PETER ST. JOHN KENNEDY,
Fellow of the Life Underwriters' Association
of Australia.

THE NATIONAL MUTUAL LIFE ASSOCIATION OF AUSTRALASIA LIMITED

wulf" written around 800 A.D. the drinking of both ale and mead is mentioned many times. Mead was drunk, apparently, by the gentry and common ale by the masses.

Brewing in England lagged behind that of Europe until the twelfth century. Ale fermented from barley alone, enjoyed great popularity among the common people. Hopped beer was introduced into England by the Flemish brewers around 1450 and encountered bitter opposition from the established brewers. Gradually however, the practice became accepted and by the sixteenth century hopped beer was the main beverage.

Between the fourteenth and sixteenth centuries less and less was brewed by the general public. Social conditions changed and a new kind of craftsman appeared—the professional brewer. Often attached to a public house or inn, these breweries produced enough beer for the surrounding countryside and beer was transported long distances in wooden casks. Professional brewers could produce a beer far superior to that made on the farms. During this transition stage we find itinerant brewers producing beer for the farmers.

Beer was widely prescribed during the Black Death which ravaged Europe in 1348-51, as a remedy for the disease. If it did not cure it, it certainly made life more pleasant and in those days when water supplies were often polluted, water was a much more health-giving drink after it had been passed through a brewer's vat.

Between the sixteenth and nineteenth centuries brewing developed into a highly skilled art. The brewer evolved a great variety of techniques and formulated empirical laws without understanding the scientific reasons behind them It was not until the nineteenth century that these principles began to be understood. Probably the most important book ever written on brewing—Pasteur's "Études sur la Bière"—was published in 1876. Pasteur devoted his life to the stldy of microorganisms and had previously published books on the souring of milk. Since then much research has been done into the chemistry of malting and fermenting and this has led to the modern technology of brewing.

In the last hundred years the growth of scientific knowledge has led to a reduction in the number of breweries but an increase in their size. Since 1875 the number of breweries in Britain has decreased tenfold while the amount of beer produced has multiplied eight times. Taxes on beer have become so high that in order to keep the price down the brewer has had to reduce the gravity of his beer to pitifully low levels. This is especially noticeable in America where the effects of prohibition are still felt. Prohibition and the clandestine brewing of bathtub beer resulted in the resurrection of methods used 1000 years before.

The brewing industry shows no sign of declining in the future. Although in the past four centuries the public has become less involved in brewing, interest in beer-drinking has shown no similar decline. With all his increased knowledge the scientist is still unable to synthesize beer and until that day the brewer will go on producing better beers as he has done for 6000 years. Long may he continue to do so.

There was a pert lass from Madras
Who had a remarkable ass—
Not rounded and pink,
As you probably think.
It was gray, had long ears, and ate grass.

There was a young lady from Thrace
Whose corsets would no longer lace.
Her mother said, "Nelly,
There's more in your belly
Than ever went in through your face."

There's a notable family named Stein:
There's Gertrude, there's Ep, and there's Ein.
Gert's prose is the bunk;
Ep's sculpture is junk;
And no one can understand Ein!

It's time to make love. Douse the glim.
The fireflies flicker and dim.
The stars lean together
Like birds of a feather,
And the loin lies down with the limb.

Notes on a speeding offence

C.S.S.

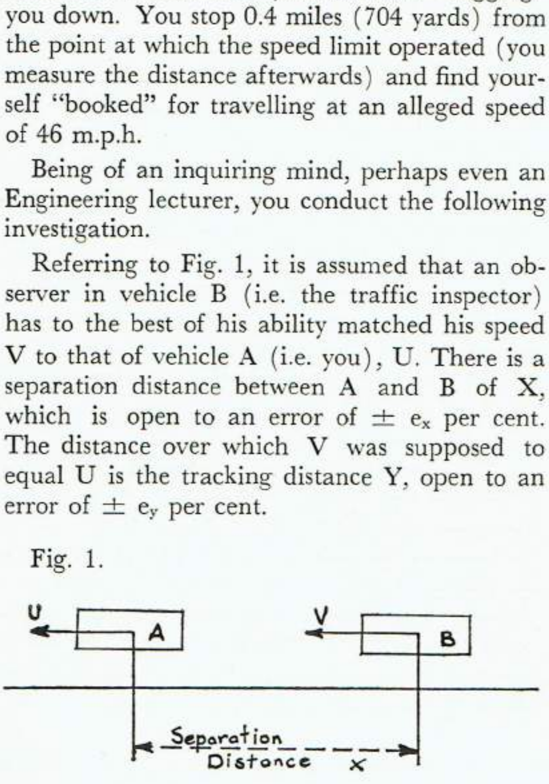
Consider this interesting situation.

Supposing you are travelling at an undisclosed speed in the vicinity of say, Mundaring, and you pass a 35 m.p.h. speed limit sign. Suppose that further down the road you observe a traffic inspector following about 200 yards behind, and a little later you find him "flagging" you down. You stop 0.4 miles (704 yards) from the point at which the speed limit operated (you measure the distance afterwards) and find yourself "booked" for travelling at an alleged speed of 46 m.p.h.

Being of an inquiring mind, perhaps even an Engineering lecturer, you conduct the following investigation.

Referring to Fig. 1, it is assumed that an observer in vehicle B (i.e. the traffic inspector) has to the best of his ability matched his speed V to that of vehicle A (i.e. you), U. There is a separation distance between A and B of X, which is open to an error of $\pm$ e_x per cent. The distance over which V was supposed to equal U is the tracking distance Y, open to an error of $\pm$ e_y per cent.

Fig. 1.



The distance range which A may be ahead of B, is

$$\text{from } X\left(1 + \frac{e_x}{100}\right) \text{ to } X\left(1 - \frac{e_x}{100}\right)$$

Thus the distance A may travel while B "matches" his speed is

$$Y \pm \frac{Ye_y}{100} \pm \frac{2Xe_x}{100}$$

The time of tracking is $\dfrac{Y(1 \pm \frac{e_y}{100})}{V}$

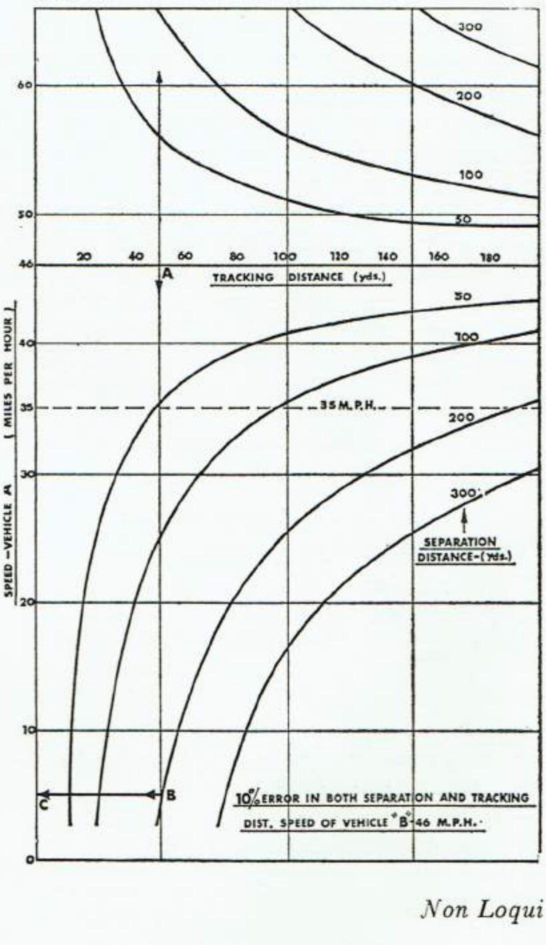
Hence the speed of A lies between the values given by

$$\frac{Y\left(1 \pm \frac{e_y}{100}\right) \pm \frac{2Xe_x}{100}}{\frac{Y}{V}\left(1 \pm \frac{e_y}{100}\right)}$$

$$= V\left[\ 1 \pm \frac{2X}{Y} e_x \left(\frac{1}{100 \pm e_y}\right)\ \right]$$

Fig. 2 Has been plotted for $e_x = e_y = 10$ per cent and a range of values for the separation distance X. Few people would claim to do better than 10 per cent in measuring distances by eye alone, and a good defence solicitor could easily establish this degree of error in a court room.

Fig. 2.



It now remains to establish the likely tracking distance in order to find the possible range of speeds which A could have and still appear to B to be travelling at 46 m.p.h.

Allow A 50 yards to decelerate and stop; then B had 654 yards in which to track A, overtake A and signal him to stop.

Suppose for the sake of argument that B tracks A at 46 m.p.h. for 254 yards. If B is 200 yards behind A, there would be 400 yards left in which he could catch A. But since he starts his "overtaking run" when A is 200 yards in front of him, B must travel 400 yards while A travels 200 yards in the same time at 46 m.p.h.; hence B must maintain an average speed (from rest) of 92 m.p.h. If you care to check the performance figures of B's motocycle, you will undoubtedly find that this machine would be incapable of such an average.

If however, we allow B 600 yards in which to catch A, it is easy to show that the average speed which he must attain is 69 m.p.h., certainly feasible although perhaps unlikely. But this would reduce the tracking distance to 54 yards.

From Fig. 2 it can clearly be seen that for a tracking distance of 50 yards, A could have any speed between 5 m.p.h. and 87 m.p.h. (off the page).

So far it has been assumed that B started from the speed limit sign 704 yards back down the road. If in fact he had been waiting in the side road 150 yards inside the restricted zone, then reference to Fig. 2 will show that A could theoretically have been going backwards when clocked by B!

If I were the driver of vehicle A, I would plead not guilty to the charge on the basis that it couldn't be proved. And I should say with confidence that my case would be dismissed.

The All-Bran Eaters

R. Shaw

It's no go the engineer, it's no go the designer,
All we want is a stevedore,
And more pay for the Collie miner.

An engineer's a mechanical man, who drives a great big engine.
Or builds a bridge or mends a bolt.
Or fixes the front suspension.

For five long years the student crams, works hard all his vacation,
Demonstrates or holds a prosh—
As a form of relaxation.

He graduates and builds a dam, or maybe designs an appliance,
Or sends a capsule to outer space,
The public congratulates science.

The "scientist" makes the water flow, the "scientist" builds the weir,
Until the bloody plans go wrong,
And they blame the engineer.

A beatle or an orator get degrees of high distinction,
The engineer sweats blood and tears,
And never cracks a mention.

It's no go the engineer, we're swinging from our axis,
That's the way the country goes,
Up go the taxes!

Your Profession and the Professional Association

The new status and public recognition that have been accorded the engineering profession in recent years result in large measure from the work of The Association of Professional Engineers, Australia. The much more attractive remuneration now available to engineers, especially in the early years of their employment, is a direct result of the activity of the Association.

The Association of Professional Engineers, Australia, was formed in 1946 as a national organisation representing all employee professional engineers. It is registered under the Commonwealth Conciliation and Arbitration Act. This means that A.P.E.A. has complete access to the Commonwealth industrial machinery and is competent to negotiate awards and agreements with employers. It is the only registered national organisation consisting solely of qualified employee professional engineers.

Engineers become eligible to join the Association as soon as they are qualified and start work in the profession.

In the broadest terms, the objective of the Association is to ensure that proper remuneration and status is afforded the professional engineer, by the community.

The now historic decision of the Commonwealth Conciliation and Arbitration Commission in the Professional Engineers' Case (handed down in June 1961) marked a turning-point in public and official recognition of the value of the profession of engineering in this country. This case—the biggest ever taken before an industrial tribunal in Australia—was planned, organised and led by the A.P.E.A.

Most engineering undergraduates are probably aware that the minimum annual salary which they must be paid on entering employment as qualified engineers with public authorities or other employers covered by the Professional Engineers' Award of 1961 is £1,660* (with a degree) and that after four years of professional experience they can expect to reach at least the "Experienced Engineer" salary rate of £2,347 a year.

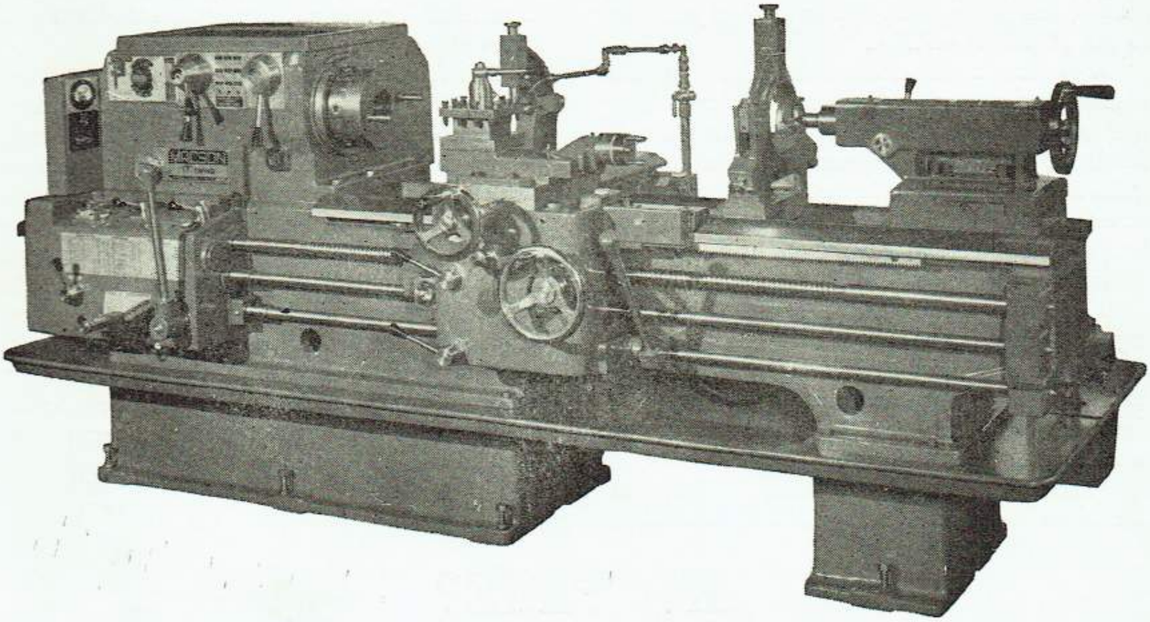
*Graduates who do not hold a B.E degree and Diplomates: £1,515 p.a. minimum, with five years of professional experience to "Experienced Engineer" level.

They may not know, however, that the salary of £2,347 is some £600 a year higher than the median salary, in 1961 of engineering graduates with four years' post-graduate experience.

The Association is governed by a Federal Council elected annually by members in the seven Branches (all States and N.T.) and each State has its own committee of management. The Association employs a substantial full time staff of trained and experienced officers to implement the decisions of its management committees and to enter into negotiations on behalf of members, answer inquiries from employers and other organisations and provide services to members which include legal advice and assistance and the Professional Engineers' Appointments Advisory Service. Present membership is approximately 9,000, of whom 3,500 are in N.S.W.; 2,700, Victoria; 800, South Australia; 900, Queensland (and Papua/New Guinea); 600, Western Australia; 400, Tasmania; and 60, Northern Territory. Membership in 1961 was 5,600 and in 1948 was 500.

The engineers who founded the Association and those who have joined since have done so realising that under conditions as they exist in Australia professional engineers working as employees need representation in dealings with governments and employers and in hearings before industrial tribunals by an efficient, well-staffed national organisation able to specialise in the handling of all matters concerning their employment.

One of the primary objectives of A.P.E.A. is the fostering of professional consciousness among engineers. The view put forward in some quarters that this is a form of snobbishness is one that misses the point and is out of perspective in our present age. There is still an image widely held (and often by those who should know better) of an engineer as an advanced tradesman or technician who operates machinery or



works with tools. The A.P.E.A. feels that this image does not help the engineer, nor in the long run, society, and is actively working to change the picture. The practice of labelling operators and technicians as engineers both on the job and in "positions vacant" notices is becoming less pronounced and in a large part due to the efforts of A.P.E.A.

A general description of the nature of the engineering profession, the methods by which training for the profession may be obtained and details of the various courses available in Australia have been set out in detail in a book published by A.P.E.A., "The Education of Professional Engineers in Australia", by Lloyd and Wilkin.

The future of the engineer and the engineering profession is the business of A.P.E.A. and the Association must devote its energy to protecting and consolidating the achievements of the past and advancing the profession in the broadest sense in the future.

(The Institution of Engineers, Australia, as the scientific-technical body of the profession, advances the practice of the profession and aspects of the professional engineers' employment. It is the industrial organisation of the engineering profession in Australia. A.P.E.A. and The Institution, while having their separate and distinct roles, work together harmoniously in maintaining and advancing the standards and status of the engineering profession).

The fee for membership of the Association is £10/10/- a year. This may seem rather steep to the undergraduate still suffering the relative penury of student life but it is only a fraction of the salary increases obtained by A.P.E.A., and from which he will benefit as soon as he starts in employment. The contributions of his more senior colleagues to the Association have made the present salary levels a reality, but the salary structure of the profession has to be maintained and improved and A.P.E.A. has many other important aims which demand for their fulfilment an ever-growing body of members in the Association.

IN TIME?

J.W.B.

Technology advances!

The advance is indomitable, accelerating, speeding with implacable compulsion. An advance self-nourishing on only part of man's nature, unregulated by the whole nature of man, creating its own purpose, its own time.

Blithely, continually machines are multiplied, power is worshipped, communities spend their whole lives trying to absorb the gargantuan productivity, submitting to its purpose—the machine, no longer auxiliary but sufficient, substitute for human purpose.

Where is the search for human purpose? Where is truth? Heedless, technology advances, amid the confusion of the 'cultural lag' of religion, morals and politics. Old truths are in doubt ,the past is rejected—man has "come of age"! Men wielding god-like power, with minds unamenable to love and understanding, curse the frustration of technical advance by failure of psychological and social invention to tailor men to dehumanised tasks. Power promoting technical progress unable to chase itself on human values rushes headlong into moral retrogression, without direction, bound in its own purpose.

Man the master of science, the technical genius with the mind of a juvenile delinquent, fostered on hate and prejudice is unable to perceive the brotherhood of the earth-bound. Coveting earth and space he destroys others in the race for possession, deceived, blind to his self-destruction.

This is the way of the economy of abundance, but a terrestial imbalance may thwart history. Those who barely exist, surge in human streams; mankind flows over the face of the earth in unconstrained integration; ancient racial fields sown with new seed and technology must preserve man or he perishes.

This must be a new technology, preserver of man but the servant of humanity, a united mankind, men of understanding, purpose and love.

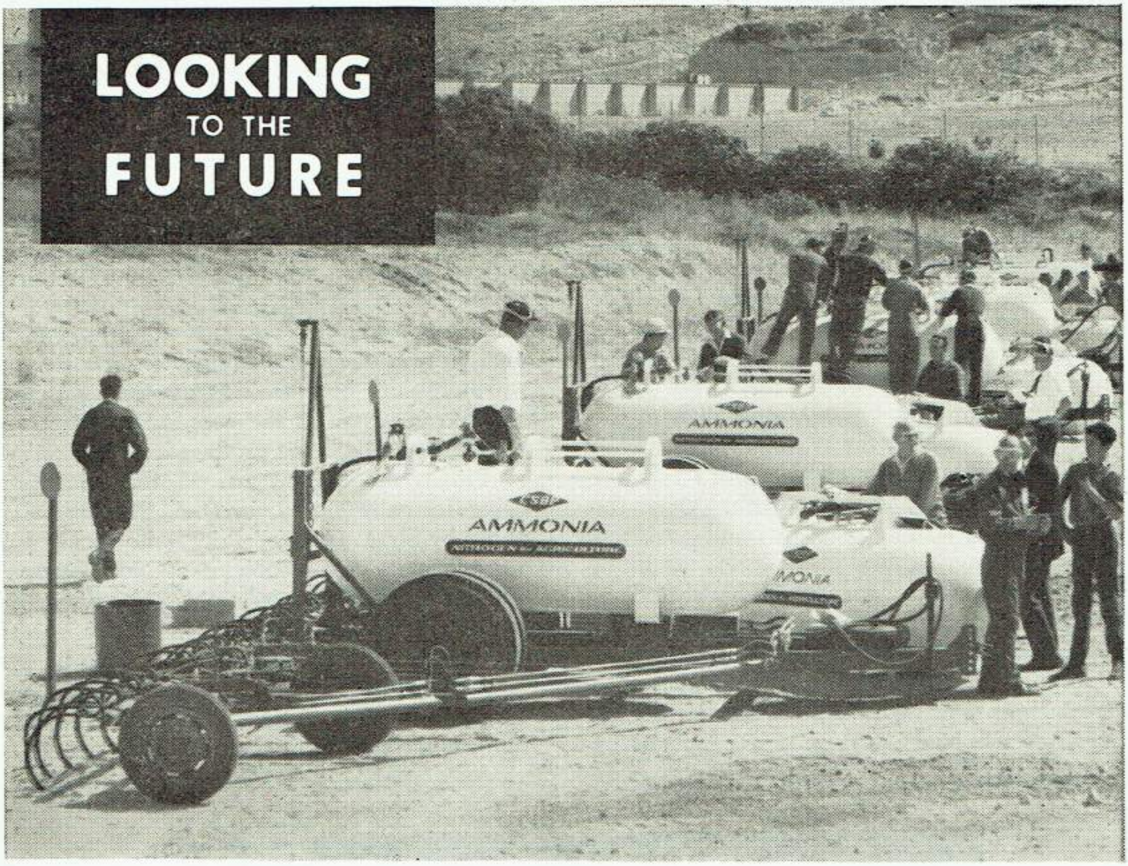
The 1964 Adelaide Symposium

Symposium—"formerly a drinking party, has descended from the Greeks who drank after meals, the party being lightened by intellectual conversation, music and dancers."—Gibbon. Striking similarity to the quotation by the 1964 Symposium was arranged by the Adelaide U.E.C., who had organised a devastating social programme to complement the week's discussion on "The Development of Northern Australia". The Symposium was formally opened with the delivery of a paper by Sir William Spooner. His speech outlined the Commonwealth's role for future development in the North. Over the next two days, leading geologists and engineers discussed the agricultural and mineral wealth of the north of Australia, the interim between these lectures being occupied by an arduous sequence of social events, which were to annihilate even the best stayers. These monumental occasions were such as to cause a boom in sales of "Morning After the Night Before" fixits, bought by symposiats who cowered under bedclothes during daylight hours.

Interesting tours to the factories of GMH and Philips were arranged, and for the remaining few stayers, a visit to a local brewery, thus proving Finks First Law that "more go in than come out." Yet this was not the end, for the final straw came in the form of a smoke social which rapidly became a swim-through, with such novel vessels as the occasional bucket and an odd umbrella being produced.

Finally the last day arrived, the Symposium being formally closed by the delivery of a paper by Sir A. Grenfell Price, who focussed on "The History and Problems of New Guinea". The symposium was *informally* closed the following day with an all-day trip to the Barossa Valley, this causing the participants to be permeated forever. The same day the weary visitors set off on wrong trains for a well earned rest, having had a really great May vacation.

LOOKING TO THE FUTURE



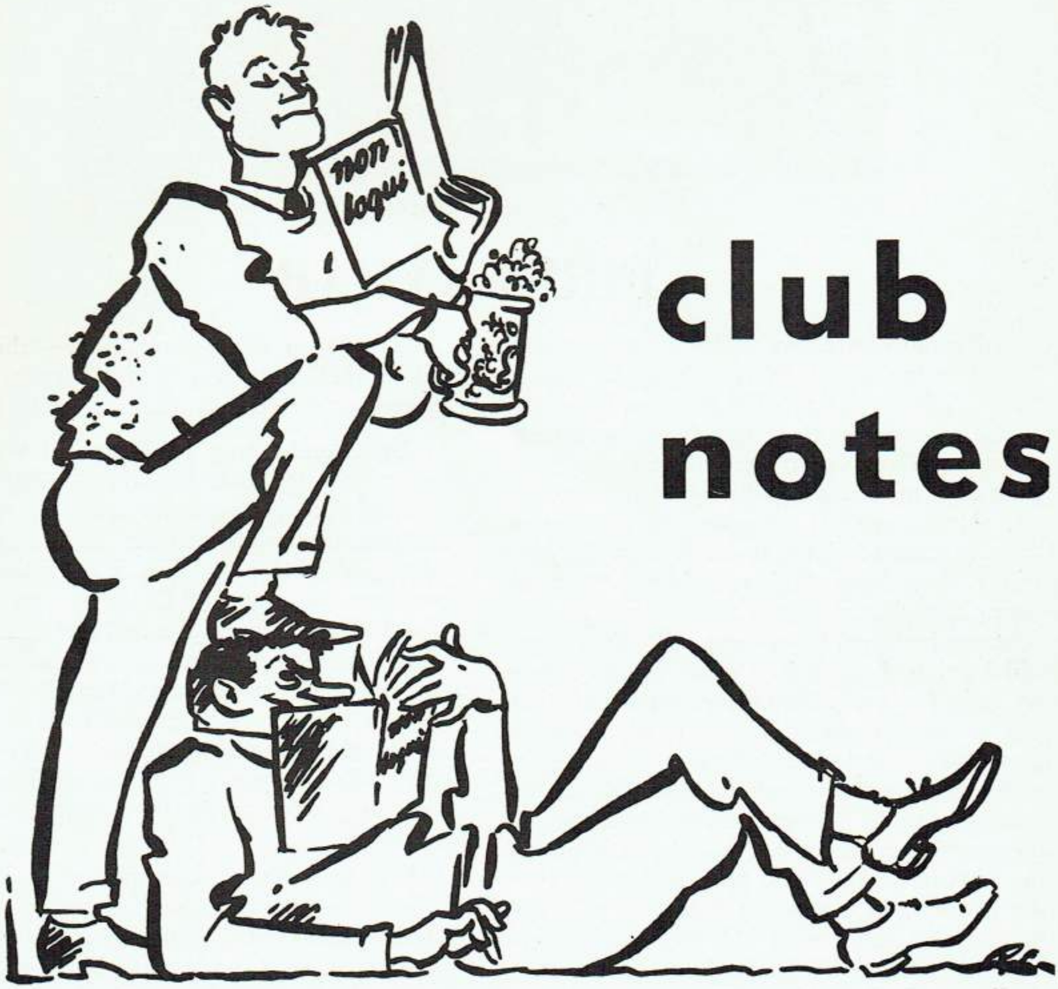
THERE are 36 graduates in Agriculture, Engineering and Science working at CSBP to continually improve fertilisers, production methods and equipment.

New fertilisers are being introduced, such as anhydrous ammonia 82% N, which differs from other fertilisers in being a liquid under pressure. Much of the special equipment has been designed at CSBP and manufactured in W.A. Pictured above are CSBP Servicemen being trained in its use.

This year over one million tons of fertiliser will be used in this State. Looking to the future we are building a new £10 million complex at Kwinana to produce high analysis fertilisers.

To be sure, Western Australia grows with CSBP.

CSBP
& FARMERS LTD



club notes

1965

FIRST YEAR

All motors were revving for the 1964 Novice Scramble Series, all riders striving to stay on their machines to finish the event and graduate to the higher class meetings of successive years.

As the First Term scramble team captain, Dick Lee proved a worthy representative. He was able to persuade a fine body of twenty men to leave their machines and ride with the illustrious First Year "initiation-inspired" Prosh float. The ultimate distinction of being premier float was bestowed upon these worthy engineers, still bearing distinguished silver nitrate tattoos on their foreheads. But more important than this honour was the 5 gall. barrel which had to be summarily spiked and disposed of before the men could remount their machines for the increasingly tricky courses confronting them. Of the years' meetings the Physics circuit proved the most hazardous, with hills that stalled even the better built machines; hairpin bends that many riders were never able to negotiate and blind alleys that led the most experienced men to disaster. It should however, be recorded that in comparison the Drawing Office circuit, under that experienced race controller, proved less difficult. In the words of one rider—"this is more like a T.T. than a scramble"—such was the speed some machines attained in the straight.

In Second Term, Paul Coronel was elected permanent scramble organiser—an appropriate choice, since he knew the course well, with all its more hazardous sections (for he has ridden the course before). First Year representation was not great at U.E.C. social functions—yet those who did attend the Ball and Dinner made their presence felt (one well known rider had trouble with a powerful vodka anti-knock additive in his fuel at Engineers' Ball. Needless to say his sidecar passenger travelled home alone). Men who did not attend, sought instead to tune their machines for the big November meeting.

While most men rode solo, several entered sidecars in the events; with attractive co-drivers to distract their concentration at every turn. It is a credit to the riding of Bill Carlton and Millen Bosich that they were able to stay on the track and complete the course under these circumstances.

While walking along a creek bank a man came across a young fellow lying lazily under a tree even though the cork on his fishing line was bobbing frantically. "Hey, you've got a bite," he said.

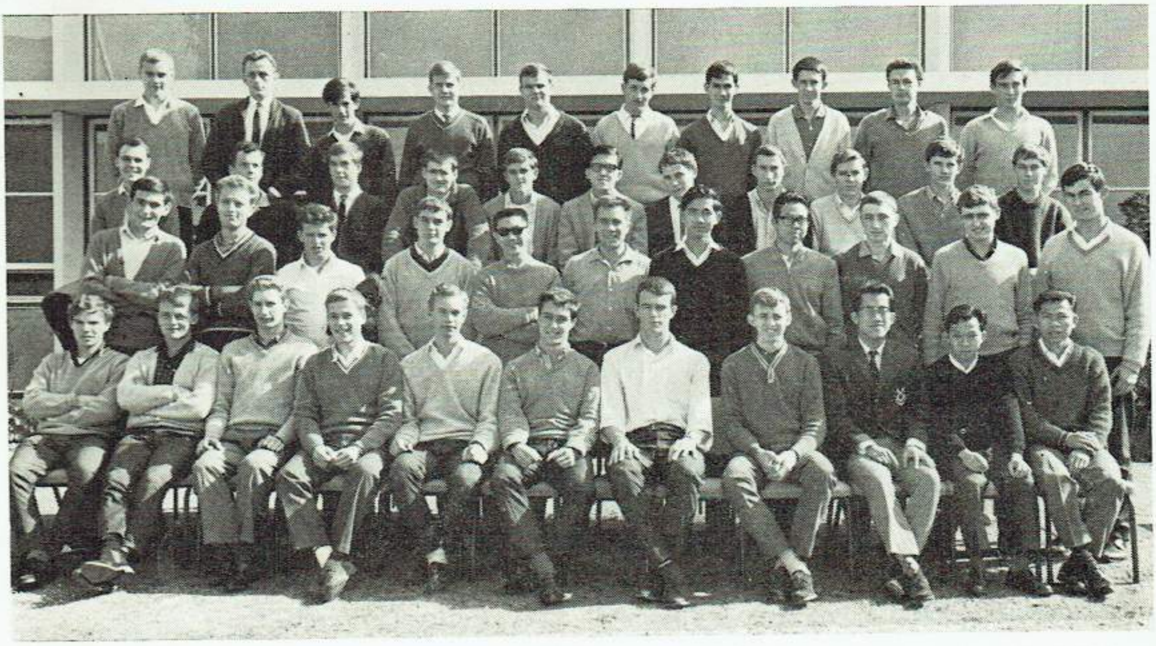
"Yeah," drawled the fisherman, "would you mind pulling it out?"

The walker did so, only to have the recumbent one ask, "Would you mind taking the fish off, rebaiting the hook and tossing it back in the creek?"

This was done and the man commented jokingly, "You ought to have some kids to do these things for you."

"Not a bad idea," yawned the fisherman. "Got any idea where I can find a pregnant woman?"

SECOND YEAR



First a few general observations; in second year you do lots of units so there's bound to be one or two that you detest. This makes it easy to get supps.

Second year is the only time the Engineering Lecturers get to bore a really large crowd—this seems to encourage them. They conduct unofficial experiments, like how long a piece of chalk will last, or the minimum number of decibels that can be produced when you are still moving your lips, and so on. However, let's leave the sordid subject of lecturers and have a look at some of the things we learned.

Generalised Mathematical Definitions.

Residue: Quantity that exists after being operated on by an annual dinner. In Ted's case we couldn't find an $\varepsilon < O$ such that

$$[\Sigma \text{ Res (Ted)} - \varepsilon] < O$$

Functions: Enjoyable exercises that consume unbelievable quantities of time and tend to leave the variable oscillating about a mean position at an ever-lowering frequency.

Saw-Tooth Wave: Doc Leary considers that these reside in intriguing places and laughed at Ian for arriving with a bandaged arm.

Circle of Convergence: Happens mostly at Bucks' Dinner and takes on different sizes depending on where it hits you. One variety is filled with water.

Absolute Inequality: the situation that exists between Lecturers and students as far as exams are concerned.

Premultiplication—pleasure?

Post Multiplication—woe.

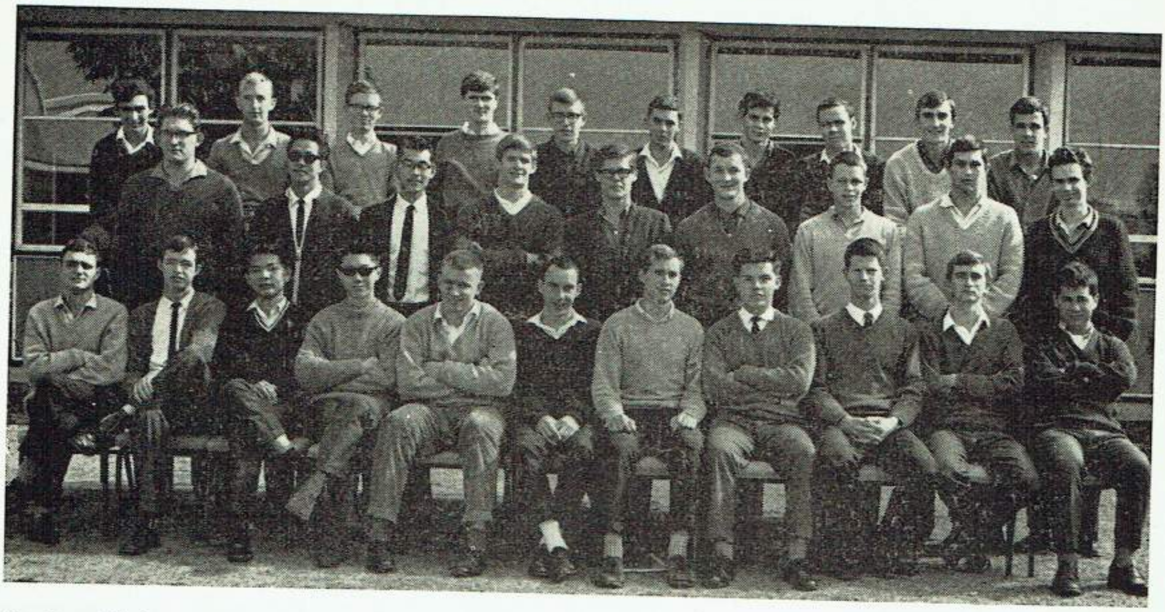
Transformation: to pervert any fixture to a use that Jules Verne wouldn't have dreamed of. Des was an expert and thanks to him we had a bowling-alley in the Mech. Lab. and a missile-gallery in the Drawing Office effectively changing hell to purgatory.

Tests for Convergence: to be used after a function when considering driving home:

1. Close left eye and focus on partner.
2. Open left eye, close right eye and focus on partner.
3. Open both eyes and focus on partner.

If what you see in "3" is your partner frantically trying to get out of the car then assume they are convergent.

THIRD YEAR



Bagley, Christopher

A loveable, cuddly fellow with big round eyes and big round tum. Outstanding statements of the year. "Hmm, 3 down, 'the' in 23 letters".

Bartley, Wayne

Arrived late for 0·491 of lectures, arrived very late for 0·502 of lectures. Said "I concentrate better with my eyes closed" for 0·998 of lectures.

Cheng, James

A happy chap, believed to be a direct descendant of the Ming dynasty. Partial to Mills and Ware Dundee Shortbread biscuits and Manjimup apples. Had trouble communicating with certain lecturers.

Craze, David

A remarkable man with a very bony scalp. Had eight hair cuts in three weeks. Research into thermodynamics revealed the effectiveness of ice in galvanised bucket. Said "It keeps it cold."

Dickerson, Alan

Long stringy bloke. Was seen driving Mini thro' Curry Hall after U.E.C. Dinner. Next day said "I don't feel well." Ate lots of other people's apples—"An apple pinched is an apple saved."

Richardson, Hugh

(Alias Hew, Hoo, Hue, Hughmann, Jim). Noted for advancing forehead, receding hair, red scooter. Often seen at Steves' and heard to remark "Got a few Aristotles in the fridge—how about popping over for a quiet one?" Val bought car to eliminate snogging on back of scooter.

Feldman, David

Seen looking for Betty under tables saying "She's about *so* high." A self-attaining gent —who wouldn't be with that proboscis. Agreed to stay in 3rd year in spirit of sacrifice above and beyond call of duty. Used six cars in 64—Rover, Oxford, 38 Dodge, Renault, Minor, Oxford.

Stewart, Peter

Played golf, played golf, played golf. Said "Par", "Birdie", "Eagle", "Putt", played golf. Said "grip", "stance", played golf. Said "Dont' give me that" to four lecturers.

Teh Jo Kee

Carried out intensive dietary research. Said "*Rice* is *good* for you." Consorted with ducks in Monger's Lake and caught carp. Left early Monday's saying "It's my turn to cook."

FOURTH YEAR Civil

Looking forward to a short year, thirteen solid-civils started 1964 with the keenness of "Keens". One can imagine how the year apparently lasted for only a week, after which the pace had dropped to a standard reminiscent of those other delightful years, where the Engineer busily and joyfully worked at fulfilling his own and his club's reputation.

Lecturers noticed this attitude immediately, and insisted on joining us. This they did during a student-staff afternoon in the common room, which brought out the other side of these not-so-inhuman specimens. Dr. Hondros used the Chebyshev Series to fit a hyperbolic paraboloid to one of our pictures on the wall, resulting in a longer than usual mmm. . . from Mr. Smith. Mr. Clegg threw our darts away while shooting for the bull, and Mr. Sacks spent a few hours telling us that he could not come to the show. Many intended twisting Mr. Reynolds' drinking arm but he chickened out and we still had to write our concrete reports.

At the present stage of our course, it seemed that the numbers would stand at a steady thirteen, but not without a battle. Since there were seven relatively new members to the original 610000 group, it was not until fourth year that the true ability and superiority of these great men was recognised the world over. In the following short descriptions, places and names have not been changed, to protect the innocent:

Malcolm Bennett—Handles a mean car and beautiful women. Young Mal was quoted as the James Bond of the year.

Ching Yin Chin—When not studying this chap spent his time telling everyone that they were working too hard. Being a Judo champ, no one tried to defend their most desired image of a non-worker.

Michael Clancy—Loves the sound of his own voice and was seen pushing his way to the top of the Irish Folk Song parade.

William Duffy—Met both his most treasured possession, and his biggest headache. These two items are still his, taking the form of a vivacious female and a broken down car, respectively.

Richard Jewell—Claimed that fourth year was the hardest yet, just to highlight his seven distinctions! Managed to scrape in an I.S.A.S. scholarship, and the second best ski-ing effort in the Snowies.

Graham Kirkaldy—Plays the field (with and without a hockey stick) and traps birds by his deep call which renders them defenceless and completely within his control.

Robert Mitson—Uncle Bob's football allowed him little time for study as he was in heavy training (breaking thumbs and noses,

etc.) in preparation for the league games in 1965. When feeling low, Bob took the High road to Fremantle.

John Peraldini—Always finds something else to do during term, and fourth year saw him training a trotter. Jim was seen occasionally at lectures, but not enough by some peoples' standards.

Frank Pitman—This man was won by two, after his fourth year efforts. I.S.A.S. liked his writing and Valda liked everything. Frank's engagement explained his behaviour on the Gledden Tour, as it now becomes obvious that he was making the most of his last fling.

Geoff Smith—Shamefully this studious student presented an outstanding case of schizophrenia during this year. He faithfully stayed with his books from May to exams, and then the change—Jan plus Saturday in Melbourne—Well done!

Joe Sweet—After three years of comparative silence, the Gledden Tour brought out this man's true character, when he was seen coolly conning a doll at Eucumbene in the Snowies.

Kia Lia Tan—A determined dart and table tennis player, Geoff is also heard wandering about judging baskets.

Ray Vitali—Came close to honours with brilliant fourth year results. Ray kept members amused by his dry jokes and foreign language, and also he informed us of Perro's absent movements.

FOURTH YEAR Mechanical

The year began quite normally, with everyone (but Hud), present. He appeared two weeks later, sporting nine fingers, a craze which was sweeping the East at that time. All joking aside, the tenth finger was nobly sacrificed to a ferocious pack of sharks in the process of saving Sir Thistle from drowning in that treacherous product of nature (?), Lake Burley Griffin. For this patriotic effort Gary undoubtedly deserved two weeks of liquid fortification, something which the rigours of the course had not allowed him time for.

Even though that course, from the outset, was difficult, two members from Mech.Eng. found valuable time to accompany an Electrical chap to a Sewage Disposal Conference held in a tin mining town between Balingup and Bridgetown. Local officials had reported that conditions were most obnoxious at night, so our brave little party, after bracing themselves with "Dutch" courage, sallied forth to form their own opinions. Their detailed investigation of the subject matter resulted in further enquiries coming from Head Office in Perth, but luckily no conclusions were reached and the matter is still up in the air (on the trees).

The next event on the Social Calendar was a Car Trial, better known under the title of "A Heavy Show in the Hills". Mechanical was well represented and compliments for a great day must go to John and Harry (for organising it), the Swan Brewery (for lubricating it), the Police (for not apprehending any of us), the women (for speaking to us the next day), the 'Murray Arms' (for putting up with us), and the Gods (for sparing us).

Ball time rolled around, but for reasons unknown, was only a moderate show.

The Engineers once again crushed (and sunk with the unwanted assistance of some prize Non-Engineering Nits) all opposition to carry off the coveted Chromium Bath Plug in the Annual Tubs Event. This powerful stroking, well-balanced, co-ordinated team was the product of that popular but fearsome coach, J. Kelly.

Just prior to the exams, two incidents occurred which affected two of our members. Coops was forcibly separated from his snorting horse of steel by a car, landing on his oversize head. This ruled him out from being at the mercy of the Lecturers in the examination, but in their usual sadistic manner they threatened to get even in the deferred exams. A week or so before the exams, Frank was stricken by the mumps, with the usual disastrous effects. But he bravely fought it and his troubles reduced considerably in magnitude, allowing him to partake of the examination ritual.

After these it was Tour Time. The six members from Mech. who were eligible all thoroughly enjoyed themselves, with some being involved in memorable events. Simon, in his usual con-

scientious manner, set out to gather a wealth of valuable data for the Human Factors Institute. This consisted of driving oneself to the limit by repeated imbibing and debauching for approximately $3\frac{1}{2}$ weeks. Needless to say, he came through with flying colours, no doubt due to his fine mental and physical condition. Only at one stage (in Queanbeyan) did his strength fail him, but it had the hidden benefit of saving him money and a considerable amount of heckling. After it was all over he was heard to remark "I thoroughly despise that kind of life, but in the interests of Science I would have no hesitation in repeating it."

Nick also began the Tour in the pink of condition, but due to over-indulgence in Adelaide, suffered a relapse in Sydney a little later. The finest medical opinion was sought, with the devastating result that Nick was to take "things" *not* so easily for a month and to lay off the usual aperitiff before a meal.

The trip through the Snowy Mountains was praised by all and once again the Mechanicals displayed their all-round ability by winning the Geehi Guzzle. This was due mainly to Peter the Ppauff, the Old Man of the Mechanicals, giving us a glimpse of the prowess he had in his younger day. He also ably illustrated the effects of a hangover by not speaking at all the next day.

Graeme, who also performed admirably, was heard to mutter the next morning after discharging breakfast—"Look, an E-type grapefruit."

The last port of call on the Tour was Melbourne, where everyone recovered by spending

three peaceful days in the guest lounge of the Chevron.

On completion of the tour, the group dispersed over Australia to their respective workplaces. A memorable occasion before the end of the year was Graeme marrying Irene, which showed that he had a vestige of sanity (and money) left after the Tour.

Miraculously, all Mechanicals earned the right to annoy the Lecturers for a further year, and speaking of this learned body, the following verse is offered to them in thanks:

"These things shall be! A loftier race
Than o'er the world hath known shall rise
With flame of freedom in their souls
And light of Science in their eyes."

P.I.C.

FOURTH YEAR Electrical

After a vacation's work which had put Australia back onto its feet electrically, the fourth year Sparks men re-assembled to face the coming year. Fully aware of its shortness, they realized that no time must be wasted—there was work to be done, immediately. So, almost as one man they headed forty-five chains in a southerly direction and commenced. They drank to last year's result, to 21sts already past, 21sts to come, to the infant year at their feet. They drank the first of many toasts to Mr. Gledden, whose canonisation, it is believed, awaits only a sign from Bacchus.

The lecture year (as distinct from the academic year) commenced inauspiciously when the first lecturer was mistaken for a lost fresher. The tone thus having been set, the year proceeded to its conclusion in a rather befuddled manner. A/the* most interesting sideline/part* to/of* (*strike out whichever is thought inapplicable) the lectures was the garb inhabited by some of the lecturers.

These were:

The Gown
The Lapels
The Sloppy Jumper
The Scarf
The Green Shirt and Shorts
The Elbow Patches and B.C.'s
The Half Masters.

Attempts at correlating styles of dress and address usually ended in failure; however study into this important matter will continue.

Socially, the year was a swinger. Much good ale, a lot of it brewed by a tight knot of 4th Year moonshiners, was consumed at U.E.C. functions. Members were seen in all manner of strange places and positions. Ed and Bathtub were seen disappearing gracefully into fifteen feet of water. Bill took the floor for the 4th years at the Bucks' dinner, and was still prone the following day, calling in muffled tones for somebody called "Bert". The same gentleman created engineering school history by being dragged from a lecture by two stalwarts of the Law and interrogated about an offence which he successfully denied. Harry organised a car trial and John C. discussed his fixation. Trevor, who had returned from a vacation in Adelaide full of the joys of spring, was responsible for bringing a 21st member onto the Gledden Tour.

Lectures brought out a number of tracts of character, e.g. Mol frequently wore dark glasses to them; John H. asked questions during and after them; Bob invariably arrived late for them; Peter shut Max up in them. An honourable mention must go to Lloyd, whose droll tales left the lads alternately amused and disgusted. He backed these tales up with demonstrations on The Tour, proving that opportunity knocks in the most improbable places.

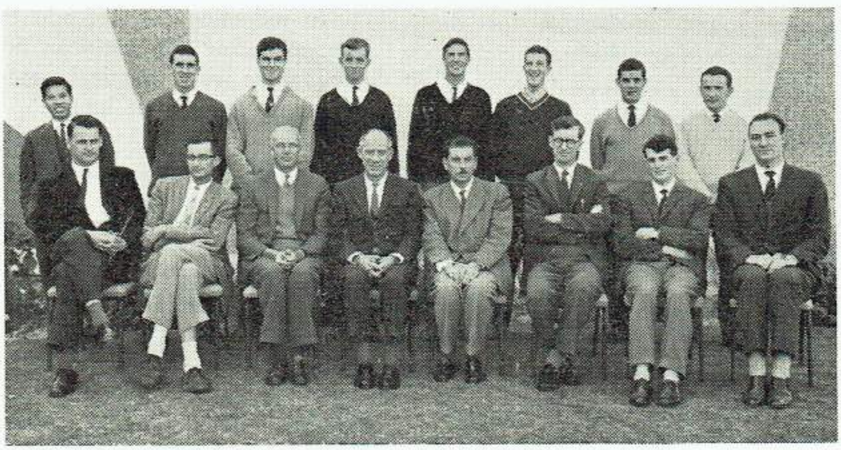
Two casualties, now lending tone to this year's 4th year, must be reported. One found a supp., taken under adverse (!) conditions in Adelaide, not to his liking. The other had to be rushed to a doctor in the middle of a lecture, causing what must surely be the quote of the year: "One week a heart attack, next week the police. It muth be thum thort of conthpirathy."

FIFTH YEAR Mechanical

This last year proved most successful. A group of eight young men passed without a hitch. The odds were against them, reputedly the dumbest mob of intending engineers seen for some time. Even to this day there remains a member of lecturers who just will not accept many of the minor great theories introduced by this eager group.

The work involved was such that it often took up seven nights a week. This meant that little time was available to relax with a textbook or jot down a report. Each man was devoted to his work and often one could be seen coming home in the early hours of the morning and sitting down to a fresh subject.

John Brearley was always a normalising fac-



tor. He would anchor the group when most were writhing amongst hangovers, yet shock us all during our more sober times.

Jack Cullen played rugby which left little time for study, after cooling off at Steve's. Soon to be married he is still with the Department of Works in Perth and only gets occasional trips interstate.

Peter Filmer was successful with his thesis on ploughing, which followed his vacation work with International Harvester. He was last heard of heading for Canberra and a job somehow connected with agriculture. Pete has always shown a keen interest in the application of hops.

Newt. Langford was the mainstay of the U.E.C. for '64. Successful management of many of the Club's functions showed his worth. Thin film lubrication with Moire fringe measurement techniques was the basis for another successful thesis. He is still with the S.E.C.

John Sang was a patient man and spent much of his time studying. He still understood maths in that last year and must receive due credit. No one can guess what John will be setting to now with his home country being torn in two.

Mel Whinnen was naturally the captain of the drawing office cricket team which put on a number of worthy displays. He wrote a prize-winning thesis on Solar distillation. Mel is still in Perth working with the Shell Oil Company.

Mike Williams had the greatest car on earth until seen tearing back and forth across the Nullarbor Plains. He wrote a sucessful thesis on space mechanisms entitled "How to destroy electronic computing elements with an appropriate mechanical parasite." Now he is working in Woomera on the ground equipment for the E.L.D.O. Satellite launching vehicle.

Alex Zadnic has not yet stopped his work. He was seen continuing in Sydney at Christmas and is now in Melbourne. He now has his own studio of course and works during the day with the Army at Marybynong Ordinance Factory.

The lecturers were not so successful and most are repeating their work at this stage. They formed a contrasting group with rather childish attitudes. They invariably made the most noise during lectures and have been known to shout, wander about aimlessly or scribble on drawings. They usually believed themselves right and would often go against the reasoning of a whole group.

Mr. Cole taught us much on fluid mechanics but unfortunately expected an understanding for the exam.

Dr. Hunka believed in fooling us into thinking we fooled him. He insisted in listening to our seminars but never laughed aloud at them.

Mr. Hemingway never listened to the seminars but just laughed. He then proceeded to ask questions and laughed again at the replies.

Mr. Lutz was head of the Department during Prof. Allen-Williams' absence. He must be commended for not bothering to examine us on the trivialities of nuclear fission.

Mr. Minchin talked of gears and vibrations. We fortunately avoided any resonant excitation and no permanent damage was done.

Mr. Noyse was happy with a cigarette and a piece of chalk, which left no hand to talk with.

Mr. Wager did his best to break us before leaving to get his Doctorate in the United United States. He taught Mr. Appleyard a few tricks, but he seemed to know some of his own.

In reflection a lot of odd things seemed to happen during this last year. Some things were hard, some were practical, some were amusing and most times were happy.

Harry had proudly demonstrated his new ultracompact sports car to his date of the evening and had spun the little wonder to a halt on a lonely country road. After a considerable amount of amorous preliminaries his girl coyly jumped out of the car and headed for a mossy spot nearby. Noticing that Harry wasn't following, she turned and said, "Hurry up and get out of the car before I get out of the mood."

Harry struggled for a minute, then mournfully said, "Until I get out of the mood I *can't* get out of the car."

FIFTH YEAR Civil

Seventeen men made final year, outnumbering the lecturers by nearly two to one in the last stand to gain a B.E. They were a varied bunch and all very keen except perhaps Jim who knew it all anyway. Ten men were competing for Honours and the course was new, which every lecturer took to mean cramming a bit more in. Mr. S. would cover a page a day, Mr. C. a chapter and the Doctor a book a day, while Mr. E. preferred not to talk at all and Mr. R. either didn't believe what he was telling us anyway or we didn't believe him. Prof. taught us CPM and late in the year Kerry was doing a Critical Path Analysis in an endeavour to find out how to catch up on six months work in one month.

Ian started the seminars in an explosive way, but when he started lighting fuses and throwing explosives around the room the Prof. was seen to squirm a little in his seat and point his feet towards the door. Mick left us somewhat suspended and Alessio ran out of words (or is he the big strong silent type?).

In the afternoons each man headed for his private sphere of research, each seeking to bring to light some new fact which would enlighten the world. Zeno, for example, was seeking a recipe for cooking concrete and brought in a female acquaintance as a consultant in this matter. Others of course were cooking results. Bruno was playing tunes in the garden. Tony's project was a little obscure but semed to involve considerable meditation over a glass of amber fluid.

Late in September Mr. Hebbert led a tour of the irrigation areas of the South West. An informative day was spent viewing dams, weirs, channels and measuring flumes, etc. A night in Bunbury was in the itinerary and a suitable party arranged. Alessio strummed and crooned well but Zeno in his usual indiscreet style tagged along. KB had a very sore head the next day. A stalwart Civil representative at Geehi, it just goes to show how married life can cause a man to degenerate.

Congratulations to Merv. In five years he never let up and thoroughly deserved 1st Class Honours, but even Merv. now seems to be paying a lot of attention to a fairer subject.

Where are they now? Jim went East, Ken and Mick to the north, Tony, Zeno, Geoff and Paddles to the country. Kerry's gone to Canada and Darb will be soon. Ian is languishing somewhere in the jungles of New Guinea. Fiery Fred, Louie, Bruno and Chiang couldn't bear to leave the place and are pursuing higher studies. Merv and Alessio haven't made up their minds.

Finally may it suffice to say—all graduated and are already dispersed equipped to make a worthy contribution to the community.

The absent-minded nurse who made the patient without disturbing the beds?

The farmer who couldn't keep his hands off his wife so he fired them?

"Did you hear about ————?"

The Careless Canary that did it for a lark?

The sleepy bride who couldn't stay awake for a second?

FIFTH YEAR Electrical

Owing to the rather peculiar variety of people that were involved in final year Electrical Engineering in 1964, and the even more peculiar variety of people involved in instructing them in the noble art of Engineering; it was decided by persons in a position to decide such things that a comprehensive study of these queer (nay peculiar) persons should be undertaken with a view to discovering their innermost thoughts, desires and erotic wishes.

After top level negotiations this magazine has secured the exclusive rights to publish this report. Unfortunately much of it is beyond the scope of this publication. However as it is such an important document it was felt essential that at least a summary should appear in this issue.

Top of the list of subjects was a certain gentleman who reminisced under the title of Engineering in History. When asked where he bought his clothes he replied " 'Gays' of course". To a similar question a young English lad replied "Woolies".

Following closely behind this venerable chap in popularity was a gentleman who when asked what he detested most could only think of razor blades! He also admitted that he did have a tendency to lecture upon subjects about which he knew nothing, the excuse being that this was the best way to learn (for him i.e.). Also suffering from this complaint were I.V.F. and Zig, who never did convince anyone that there actually was an aether.

As the survey progressed it was found that the staff did not monopolise the interest of the investigators. One gentleman always went under the title of "Nobo the ——" due to his reputation with the girls of a certain women's college. Neil Crosby also represented the U.E.C. in rugby. Unfortunately no-one was ever able to find out why "Speedy" Baldock never exceeded a safe speed in his M.G.A.

When Mal Green was asked if he laughed much he replied "Yes, I chuckle at every show". Under the same topic is that quote of G.H.W.'s heard often in the early hours of midday "Hell, I feel crook, hell I had a good time last night, hell I made a —— of myself."

To gain an insight into the other side of the characters the spies responsible for this work took themselves along to the Staff-Student Golf Day, where Brian was voted the best dressed man, in holey jeans and Wellington boots.

Voted most unlikely to get a "hole in one" was Dunc. who was caught straightening out a driver in the fork of a tree.

On another social occasion Noel Gray was observed to slip between a certain sailing vessel and a wharf—he was quite sober of course.

It was reported that on the night of the Ball a certain lecturer had difficulty in finding a baby sitter as his honours student desired to take the one in mind out. When Jack Biggins was asked whether he had this trouble he replied "No, I have been lucky so far." Terry Tressider wasn't available for comment.

During the course of the investigation Dick Smith's keenness in the Control Systems lab. confused the sleuths, as it was out of character for this department, until it was discovered that he planned returning in 1965. It is suspected that some others had similar plans.

During the early part of investigations Tajul and T.M. were suspected of being up to some plot, until it was discovered that Tajul was the only Power student and J.M. his lecturer.

To the dismay of the interviewers Howard was not available to give any of his dry remarks, but Zig's jokes were some sort of substitute. Kim Yeoh was noticed as being very polite in smiling at these criticisms.

At this stage of the report Peter Wood returned to England, Kim Yeoh went back to Malaya, Neil Crosby went to Sydney to climb T.V. towers for A.W.A. where he found Graham Whitehead working for C.I.G., Noel Gray in with the opposition at S.T.C. and Jack Biggins at I.C.I. It is believed that Tajul is with the electricity authority in Malaysia, Geoff. Baldock is with W.R.E. in Adelaide as also is Terry Tressider. Of the ten graduates only two remained in Perth, Mal Green, with the Commonwealth and Dick Smith with B.G.L.

So we terminate our survey, not daring to make any general remark; other than the thought from those ten above who were students that these were some of the best years of their lives, and that the remaining nine of the above motley crew contributed more than can be expressed to this being the case.

Faculty of Engineering 1965

Dean of the Faculty:

Professor ALAN REGINALD BILLINGS

CIVIL ENGINEERING

Professor:

K. L. COOPER, B.Sc. (W. Aust.), M.A., B.Sc. (Oxon.), M.I.C.E., M.I.E.Aust., F.Inst.W.Sc., 1953.

Senior Lecturer and Testing Officer:

J. R. ESPIE, B.E. (W. Aust.), M.I.E.Aust., 1955 (1947) (On leave).

Senior Lecturers:

B. CLEGG, B.E. (W. Aust.), A.M.I.E.Aust., 1956.

G. HONDROS, B.E., Ph.D. (W. Aust.), F.A.S.C.E., M.I.E.Aust., M.A.C.I., 1955 (1946).

P. C. MASSEY, B.E., B.A. (W. Aust.), Ph.D. (Cantab.), A.M.I.E.Aust., M.N.Z.I.E., 1955.

R. SILVESTER, B.A., B.E., Ph.D. (W. Aust.), M.I.E.Aust., A.M.I.C.E., 1956 (1949).

B. G. A. SMITH, B.E. (W. Aust.), A.M.I.E. Aust., 1963 (1960).

R. H. B. HEBBERT, B.A.Sc. (Br. Col.), M.Sc. (Queen's), 1963.

G. C. REYNOLDS, M.E. (Adel.), A.M.I. Struct.E., A.M.I.E.Aust., 1962.

Senior Lecturer in Surveying:

R. SACKS, B.Sc. (Surv.) (Cape T.), F.R.I.C.S., M.I.L.S. (Transvaal), L.S.A., M.I.S.Aust., 1960.

Lecturer in Drawing:

S. J. THOMAS, Dip.Mech.Eng. (Perth Tech. Coll.), 1961.

Temporary Lecturer:

N. H. G. MUELLER, B.E. (W. Aust.), 1964 (1963).

Temporary Senior Demonstrator:

D. M. DEVENISH, M.R.A.S., 1964.

ELECTRICAL ENGINEERING

Professor:

A. R. BILLINGS, B.Sc. (Eng.), Ph.D. (Lond.), A.M.I.E.E., S.M.I.E.E., M.I.E.Aust., 1959.

Reader:

K. W. TAPLIN, B.E. (W. Aust.), M.I.E.E., M.I.E.Aust., 1947.

B G. LEARY, B.E. (N.S.W.), Ph.D. (Belf.), A.M.I.E.E., 1961.

J. MILLS, M.Eng.Sc., Ph.D. (W. Aust.), A.M.I.E.Aust., 1963 (1954).

Senior Lecturers:

J. H. BUNDELL, M.Sc. (Eng.) (Lond.), D.I.C., B.E., Ph.D. (W. Aust.), A.M.I.E.E., A.M.I.E.Aust., 1957 (1948)

J. V. FALL, B.E. (W. Aust.), Ph.D. (Lond.), A.M.I.E.E., M.I.E.E.E., 1958 (1952)

D. H. STEVEN, B.Eng., Ph.D. (Sheff.), A.M.I.E.Aust., 1964 (1954).

Z. L. BUDRIKIS, B.Sc., B.E. (Syd.), 1965 (1962).

MECHANICAL ENGINEERING

Professor:

D. J. F. ALLEN-WILLIAMS, M.A., Ph.D. (Cantab.), M.I.E.Aust., A.M.I.C.E., A.M.I. E.E., 1958.

Reader:

J. A. COLE, M.Sc. (Manc.), M.A.S.M.E., A.M.I.Mech.E., 1961 (1958).

Senior Lecturers:

G. G. LUTZ, B.E. (W. Aust.), M.I.E.Aust., 1946 (On leave).

R. S. MINCHIN, B.E. (W. Aust.), A.M.I.E. Aust., 1955 (1949).

J. HUNKA, Dr.Ing. (Lodz), Dipl.Ing. (Danzig), A.M.I.E.Aust., 1960.

E. W. HEMINGWAY, B.Sc. (Eng.) (Lond.), D.I.C., A.F.R.Ae.S., A.M.I.E.Aust., A.M.I. Mech.E., 1960.

J G WAGER, BE. (W. Aust.), A.M.I.E.Aust., 1963 (1957) (On leave).

R. B. NOYES, B.S. (Mech.Eng.) (Purdue), M.S. (Mech.Eng.) (Oregon State), 1964 (1963).

Lecturer:

J. A. APPLEYARD, B.Sc. (Leeds), A.M.I. Mech.E., 1963.

Temporary Lecturers:

J. R. BLAIR, B.E. (Edin.), 1963.
G. J. ROCK, B.E. (W. Aust.).

STUDENTS, 1964

FIRST YEAR:
Acalinovish, V. A.
Armitage, P. R.
Armstrong, D. W.
Avery, A. E.
Bassett, R. L.
Bocking, D. M.
Bombak, P. J.
Bosich, M. E.
Briggs, G. F.
Broder, J.
Brown, J. M.
Burt, P. A. M.
Campbell, R. McA.
Cantoni, A.
Cappelletti, J. C.
Carlton, W. G.
Charman, I. W. S.
Chintakananda, A.
Chwal, S. P.
Coronel, P. T.
Cygler, E.
Dawson, P. J.
De Beaux, T. J.
De Vajda, A. B.
Della-Bosca, J. C.
Eastlake, P. J.
Elias, B. R.
Field, I. C.
Fitzpatrick, M. D.
Follinus, K.
Fong, S. H.
Fuller, T. A.
Garratt, G. R. M.
Gilby, J. O.
Gill, J. I.
Gillies, H. D. J.
Graham, B. H.
Greay, B. K.
Gunn, R. I.
Hall, G. V.
Harmsen, W. C.
Hassell, J. A.
Heath, R. J.
Henneveld, M.
Hindge, J. F.
Hoe, S. H. C.
Hoffman, L. S.
Hopwood, P. F.
Hough, D. G.
Hover, C. D.
Hughes-D'Aeth
Hyde, B. H.
Jarvis, C. J. E.
Kings-Lynne, T. A.
Langdon, H. J.
Lantzke, R. T.
Lee, R. W. G.
Leishman, J.
Leivers, G.
Llorens, J. P.
Loftus, I. M.
Loke, K. W.
Lundy, M. G.
McCarter, J. C.
Mackinlay, D. B.
Male, R.
Manolas, K.
Markey, G. J.
Martin, G. S.
Matassa, M.
Maynard, A. J.
Middleton, M. R.
Miller, G. D.
Milne, R. G.
Milosz, G. R.
Morrison, I. J.
Nicholson, P. G.
Noonan, D. E.
O'Donoghue, R. M.
O'Neill, M. R.
Okis, J.
Oliver, J. S.
Ong, S. C.
Peh, K. C.
Pierce, C. A.
Poole, P. E.
Reith, A. D.
Richards, B. M.
Scott, P. E.
Shugg, K. M.
Sobejko, K. S.
Stratton, R. C.
Sylwestrzak, D. A.
Talianchich, M. M.
Tang, B. K.
Tate, C. M.
Taylor, M. R.
Teo, E. P.
Teo, H. L.
Then C. P. H.
Toth, A. J.
Upton, G. P.
Ventriss, H. B.
Vincent, G. F.
Wall, J. A.
Walter, K. R.
Want, F. M. O.
Waring, R.
Watkins, R. G.
Watson, G. R.
Watt, Y. K.
Williams, A. S.
Wong, W. C.
Yovich, D. J.

SECOND YEAR:
Abbey, G. J.
Allen, K. G.
Allison, D. M.
Arnott, T. W.
Begent, M. J.
Bennett, P. G.
Brooksbank, B.
Chan, M. K.
Chang, K. F.
Clarke, B. A.
Clarkson, G. A. D.
Flintoff, W. T.
Frank, H. J.
Gardner, D. E.
Halleen, M. D.
Hambleton, D. V.
Harvey, D. R.
Ho, K. N.
Hoile, R. A.
Jeffery, I.
Jeffreys, J. D.
Kerr, P. G. H.
Kikoros, G. C.
Kirkham, L. O.
Kosina, C. J.
Lee, R. W. K.
Lim, J.
McCarthy, D. P.
McDonald, I. N.
McLean, I. A.
McMath, T. W.
Mac, N. B.
Macey, D.
Marie, G. V.
Mercer, R. W.
Mirkva, J. F.
Nathan, C. J.
Ng Francis, W. H.
Ng, K. W.
Ng, Valentine M. W.
Oehlers, R. R.
Palmer, J. D.
Paterson, R. J.
Paton, I. H.
Popham, R. G.
Pritchard, E. D.
Robinson, K. L.
Roesenosoeksmadi
Rozlapa, A.
Said, M. M.
Schon, I. T.
Schoonens, P. C.
Shier, F. W.
Slee, M. A.
Sleeman, J. A.
Somow, A.
Spencer, J. R. V.
Thomas, A. D.
Ung, T. K.
Wallace, P. A.
Wallis, J. F.
Walters, K. J.
Warnock, J. S.
Warokka, W.
Wilkie, J. Mc.
Winslade, R. J.
Yeoh, S. H.
Yuille, J. A.

THIRD YEAR:
Civil
Barabowski, N.
Coxon, J. R.
Faul, R. C.
Hewitt, B. E.
Ladner, P. A.
McCullough, R. H.
Mace, H. J.
Phillips, P. E.
Pritchard, R. G.
Rushton, D.
Temby, C. R.
Theunissen, R. F.
Wildy, I. D.
Wu, W. Y.

Mechanical
Bagley, C. A.
Bartley, J. W.
Cheng, H. P.
Craze, D. J.
Dickerson, A. W.
Eastwood, R. T.
Feldman, D. F.
Richardson, H. W.
Stewart, P. G.
Tang, D. L. P.
Teh, J. K.

Electrical
Chapman, G. C.
Coghlan, B. A.
Cole, R. J.
Corish, W. A.
Dufty, P. O.
Irvine, J. T.
McGill, K. J.
Malyniak, R.
Moore, K. M.
Mount, R. M.
Nawawi, B. M.
Ridzuan, B. H. M. S.
Winters, K. J.
Veal, C. P.
Wong, K. T.

FOURTH YEAR:
Electrical
Cole, T. W.
Collins, J. D.
Harvey, P. J.
Hullett, J. L.
Lazarus, E. D.
Molinari, B. P.
Southwood, W. A.
Tai, K. C.
Burden, H. J.
Drok, A. H.
Harris, L. R.
Paget, W. R.
Sung, Y. N.
Thoo, Y. W.
Townshend, J. M.
Alderson, R.
Walker, P. J.

Civil
Bennett, M. G.
Chin, C. Y.
Clancy, M. F.
Duffy, W. J.
Jewell, R. J.
Mirkaldy, G. T.
Mitson, R. A.
Peraldini, J. M. P.
Pitman, F. S.
Smith, G. C.
Sweet, J. R.
Tan, K. L.
Vitali, R. J.

Mechanical
Blackman, G. R.
Cooper, P. I.
Hudson, G. R.
Hueppauff, P.
Kelly, J. H.
Musk, F. A.
Stanford, S. A.
Stevenson, C. S.
Vandeth, S. H.
Humphrey, N. E.

FIFTH YEAR:
Electrical
Baldock, G. C.
Biggins, J. A.
Crosby, N. R.
Gray, N. D.
Green, M. D.
Smith, R. H.
Tajul, A. b. N.
Tressider, T. N.
Whitehead, G. H.
Yeoh, K. K.

Civil
Bartley, K. M.
Chandashoto, S.
Chiang, S. P.
Chodorowski, T.
Cole, M. F.
Cook, D. J.
Fawcett, I. W.
Formentin, A. L.
Gobolos, Z.
Lee, C. L.
Middleton, A.
Mogridge, G. R.
Padley, J. W.
Paul, M. J.
Rinaldi, B. A.
Ryan, J. E.
Wark, K. R.
Wells, I. M.

Mechanical
Brearley, J. E.
Filmer, P. J.
Langford, S. N.
Sang, N. H.
Whinnen, A. M.
Williams, M. J.
Zadnik, A.
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